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REMARKS/ARGUMENTS

As recited in claim 1, the present invention is directed to an ink-jet recording method for recording images on a base material by jetting UV-setting ink-jet ink which contains at least color materials, UV-polymerizable compound, and photo-induced polymerization initiator in a water-based medium onto the base material. In this method, ultraviolet rays are applied to the jetted inks within a contact time in which the rate of ink transfer to the base material is from 5 ml/mm^2 to 20 ml/mm^2 by the Bristow method after the ink reaches the base material.

It is submitted that the claimed parameters are not arbitrary selections but rather important to attaining the object of the invention. As disclosed in the specification hereof, if ultraviolet rays are applied to jetted ink before the jetted ink is not absorbed sufficiently in a base material, the ink dot size that results may be insufficient and the jetted ink may be hardened insufficiently (see page 6 lines 18-19).

On the other hand, if ultraviolet rays are applied to jetted ink after the jetted ink is absorbed excessively in base material, insufficient color material may be held on the surface of the base material to give an image density

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level sufficient for good results, (see page 6 lines 4-6).

Since the ink absorption rate of a base material may be influenced both by the characteristics of ink and the characteristics of the base material, the optimum timing to apply or irradiate ultraviolet rays may change depending on the characteristics of the ink and also the characteristics of the base material.

The present invention is based on the discovery of how to measure meaningful parameters necessary to meet the objects. That is, as a practical matter, what does "optimum timing" mean. The present inventor conceived not only the principle of timing to apply ultraviolet rays onto jetted ink on a base material based on the ink absorption rate of the base material for the jetted ink but also how to provide a meaningful measuring method to determine the required parameters. The present invention as claimed requires to use the rate of ink transfer measured by the Bristow method as the ink absorption rate of the base material for the jetted ink, (from 5 ml/mm^2 to 20 ml/mm^2) to determine the time for irradiation.

As a result, by the application of ultraviolet rays after the rate of ink transfer to the base material becomes at least 5 ml/mm^2, the resulting ink dot size is sufficient and the jetted inks can be hardened sufficiently. Further,

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by the application of ultraviolet rays before the rate of ink transfer to the base material becomes 20 ml/mm^2, color material of the ink can be held on the surface of the base material, the image density level becomes sufficient.

In summary, according to the method recited in claim 1, when ultraviolet rays are applied to the jetted inks within a contact time in which the rate of ink transfer to the base material is from 5 ml/mm^2 to 20 ml/mm^2 by the Bristow method after the ink reaches the base material, all above advantages can be obtained (see specification, page 6 lines 7-19).

There are four rejections of the claims. The primary references are Matsushima and Yamamoto and the secondary references are Yasuda and Ohya. More specifically:

1. Claims 1-4 are rejected under 35 USC 103(a) as being unpatentable over Matsushima in view of Yasuda.

2. Claims 1-4 are rejected under 35 USC 103(a) as being unpatentable over Yamamoto in view of Yasuda.

3. Claims 1-4 are rejected under 35 USC 103(a) as being unpatentable over Matsushima in view of Ohaya.

4. Claims 1-4 are rejected under 35 USC 103(a) as being unpatentable over Yamamoto in view of Ohaya.

As described in Abstract, Matsushima only discloses ink for ink-jet printing and printing mechanism therewith in

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order to obtain ink which is free from blotting of the dye.

In the specification, Matsushima only teaches to irradiate ultraviolet rays for 5 seconds after ink was jetted on a base material. Timing of the UV irradiation is not discussed or suggested as an important parameter to get good results, only to harden the ink.

Therefore, as the Examiner indicates in the rejection, Matsushima teaches nothing about a timing to apply ultraviolet ray to UV-setting ink. Further, in Matsushima, there is no motivation to determine an optimum timing to irradiate ultraviolet rays. There is no suggestion that this is an important parameter to consider or any other reason to combine with secondary art with respect to varying the timing of UV irradiation.

In order to bridge the deficiency of Matsushima, the Examiner cites Yasuda on the reasoning that such a combination is obvious to have "high water resistance and high quality printed image."

However, as the Examiner admits, Yasuda merely teach that the ink receiving layer had a water absorption of 25 ml/m^2 as determined by the Bristow method (see column 12 lines 24-26). That is, the measurement was used to define a characteristic of the image receiving layer. The measurement was not related to UV irradiation.

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Yasuda teaches nothing about UV-setting ink-jet ink or a UV irradiating device. Furthermore, the disclosure at column 12 does not support the Examiner's reasoning that it would be obvious to use this teaching to produce high water resistance and high quality printing. These results are not related to UV setting for any purpose.

Accordingly, as with Matsushima, Yasuda absolutely teaches nothing about timing to irradiate ultraviolet ray or that it should be controlled by any characteristic of the ink receiving layer.

Therefore, it is submitted that no combination of the art would lead one to conceive a timing to irradiate ultraviolet ray from the teaching of Yasuda. Even taking Matsushima and Yasuda in combination, it would not have been obvious to conceive of the present invention as required by claim 1.

In the second rejection, the Examiner cites Ohya to combine with Matsushima.

However, as with Yasuda, Ohya merely teach a transfer amount of ink ml/m^2 measured by the Bristow method (see paragraph [0036]) for defining the ink-receiving layer. The Bristow method is not the invention claimed, it is a known method of measuring a parameter.

Ohya teaches nothing about UV-setting ink-jet ink and a

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UV irradiating device. More important is the fact that Ohya absolutely teaches nothing about timing an irradiation with ultraviolet rays, as related to the parameter measured by the Bristow method. There is no suggestion that the timing of the irradiation is an important parameter related to this parameter.

Therefore, since an ordinary person would not conceive to timing irradiation by ultraviolet rays from the teaching of Yasuda, even if taking Matsushima and Ohya in combination, the present invention as claimed in claim 1 would not have been obvious. Even if combined, the result is not the claimed invention.

The second set of rejections are based on Yamamoto as the primary reference. Yamamoto teaches a thick film printing method with the use of UV-curing type ink containing a photo curable prepolymer, a photo curable monomer, and a photo initiator, see paragraph [0008] and [0042]. Although Yamamoto teaches to irradiate with ultraviolet rays, it is important that the irradiation is immediately following the ejection without a time elapse (see ABSTRACT, paragraph [0053] and the claims).

Also, these are different issues. The UV-curing type ink of Yamamoto does not contain water. Therefore, it is quite different from the UV-setting ink-jet ink of the

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present invention which contains at least color materials, UV-polymerizable compound, and photo-induced polymerization initiator in a water-based medium. Therefore, one of ordinary skill would not consider measuring the rate of ink transfer to the base material by the Bristow method.

Further, since Yamamoto teaches to irradiate ultraviolet rays immediately following the ejection without a time elapse, Yamamoto teaches away the method of the present invention of irradiating ultraviolet rays after the rate of ink transfer to the base material becomes 5 ml/mm^2. At least, one would not consider that there may be an advantage to delaying the time of irradiation on any basis and certainly not on the basis of a Bristow method measurement. Nor is there a reason to do so.

In view of the above, it is submitted that the present invention is not shown or suggested by the combined art and may even be "taught away from" by the teaching in Yamamoto. Allowance of the application is therefore respectfully requested.

Respectfully submitted,

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